Metallurgical and Materials Transactions A: Physical Metallurgy and Materials Science 2015

The Portevin–Le Châtelier Effect in a Metastable Austenitic Stainless Steel

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Abstract

© 2015 The Minerals, Metals & Materials Society and ASM International The Portevin–Le Châtelier (PLC) effect was investigated in a high-alloy metastable CrMnNi cast steel during tensile tests for the range of deformation temperatures between 293 K and 413 K (20 °C and 140 °C) and for nominal strain rates ranging between 10^{-4} and 10^{-1} s^{-1}. Analysis of the stress–strain curves was complemented by in situ measurements of thermal and acoustic emissions as well as by digital image correlation, enabling determination of various local characteristics of plastic flow and clarification of individual contributions of different microscopic mechanisms involved in plastic deformation. It was shown that the PLC effect in the investigated CrMnNi steel was caused by the diffusion of interstitial atoms in the bcc phases.

http://dx.doi.org/10.1007/s11661-015-2953-x